DETD(51)

10/28/95

The . . . inside of the enclosed heat exchanger unit 56. Similarly, the O-ring 79 on flange 78 abuts the inside of the **flange** 109 on outer casing **cap** 52. Further, the coils 16 abut the outside diameter of interior housing 20. A force is then applied to the. . .

DETDESC:

DETD(53)

The . . . flange 78 at the larger end, or top of the enclosed fiber bundle unit 54 is resiliently urged against the **flange** 109 on the end **cap** 52 of the enclosed heat exchanger unit 56. The O-ring 79 on flange 78 provides a seal between the top. . .

DETDESC:

DETD(55)

The . . . an adhesive to ensure gastight joints. Specifically, the one-way valve 69 is connected to the port 118 in the top **cap** 32. The **flange** 114 on top **cap** 32 is then inserted into the aperature 108 on the outer casing cap 52. The bayonet tabs 116 correspond with. . .

US PAT NO: 5,158,533 [IMAGE AVAILABLE] L6: 4 of 10
US-CL-CURRENT: 604/4; **422/46**, **47**, **48**; 604/6, 319, 321, 403

DETDESC:

DETD(23)

As . . . canister 10 is secured to the side walls 14 of the unit by means of a tongue and groove or **flange** orientation. The portion of the **cap** or lid 20 which overlies the water seal chamber 84 and manometer 86 is sealed with respect to the remainder. . .

DETDESC:

DETD(25)

Within the inner flange 92 is a crosswise **flange** 96 perpendicular to **cap** 20 which divides the area circumscribed by flange 92 into two parts.

US PAT NO: 5,124,127 [IMAGE AVAILABLE] L6: 5 of 10
US-CL-CURRENT: **422/46**; 95/51; 96/6; 128/DIG.3; 210/321.74, 321.79, 321.83, 321.88, 487, 497.1; 261/DIG.28; **422/48**

DETDESC:

DETD(40)

The **cap** 52 has a downwardly depending **flange** 109 which forms a circular hole or aperture 108 in the center of the cap 52 (FIG. 3). There are. . .

DETDESC:

DETD(41)

The outer periphery of the outer casing **cap** 52 also has a depending **flange** 110 (FIG. 5) substantially parallel to the longitudinal axis of aperture 108. The flange 110 corresponds to the shape of. . .

DETDESC:

DETD(52)

The . . . inside of the enclosed heat exchanger unit 56. Similarly, the O-ring 79 on flange 78 abuts the inside of the **flange** 109 on outer casing **cap** 52. Further, the coils 16 abut the outside diameter of interior housing 20. A force is then applied to the. . .

DETDESC:

DETD(54)

The . . . flange 78 at the larger end, or top of the enclosed fiber bundle unit 54 is resiliently urged against the **flange** 109 on the end **cap** 52 of the enclosed heat exchanger unit 56. The O-ring 79 on flange 78 provides a seal between the top. . .

DETDESC:

DETD(56)

The . . . an adhesive to ensure gastight joints. Specifically, the one-way valve 69 is connected to the port 118 in the top **cap** 32. The **flange** 114 on top **cap** 32 is then inserted into the aperture 108 on the outer casing cap 52. The bayonet tabs 116 correspond with. . .

US PAT NO: 4,182,739 [IMAGE AVAILABLE] L6: 6 of 10
US-CL-CURRENT: **422/47**; 128/DIG.3; 435/2

DETDESC:

DETD(28)

Sealingly . . . 302 having an integral closed bottom, and which is bonded hermetically around its upper periphery to a downwardly extending peripheral **flange** 304 depending from the top **cap** 290. The bottom of the defoamer shell 302 includes an inner upwardly concave portion forming an annular seat 308 for. . .

DETDESC:

DETD(29)

As . . . defoamer upper support member 316, which in turn is bonded to a downwardly extending cylindrical boss 317 in the top **cap** 290; and a lower cylindrical **flange** 318 extending downwardly from the defoamer lower support member 309. Both the cloth 312 and the defoamer 300 are advantageously. . .

US PAT NO: 4,138,464 [IMAGE AVAILABLE] L6: 7 of 10

US-CL-CURRENT: **422/46**; 128/DIG.3; 165/133; **422/47**

DETDESC:

DETD(27)

Another . . . and a necked-in portion 185 at its bottom including a cylindrical flange 187 surrounding a central aperture 189. This cylindrical **flange** of the end **cap** 179 is sized to mate with the external diameter of a cylinder 191 and bonded thereto with a suitable material. . .

DETDESC:

DETD(44)

Sealingly . . . 302 having an integral closed bottom, and which is bonded hermetically around its upper periphery to a downwardly extending peripheral **flange** 304 depending from the top **cap** 290. The bottom of the defoamer shell 302 includes an inner upwardly concave portion forming an annular seat 308 for. . .

DETDESC:

DETD(45)

The . . . defoamer upper support member 316, which in turn is bonded to a downwardly extending cylindrical boss 317 in the top **cap** 290; and a lower cylindrical **flange** 318 extending downwardly from the defoamer lower support member 309. Both the cloth 312 and the defoamer 300 are advantageously. . .

US PAT NO: 4,138,288 [IMAGE AVAILABLE] L6: 8 of 10
US-CL-CURRENT: 435/2; 128/DIG.3; 165/1, 163, 184; **422/46**, **47**

DETDESC:

DETD(26)

Another . . . and a necked-in portion 185 at its bottom including a cylindrical flange 187 surrounding a central aperture 189. This cylindrical **flange** of the end **cap** 179 is sized to mate with the external diameter of a cylinder 191 and bonded thereto with a suitable material. . .

DETDESC:

DETD(43)

Sealingly . . . cylindrical injection-molded, polycarbonate plastic defoamer shell 302 which is bonded hermetically around its upper periphery to a downwardly extending peripheral **flange** 304 depending from the top **cap** 290. The bottom of the defoamer shell 302 is sealed by a vacuum-formed, polycarbonate plastic bottom cap 306, which includes. . .

DETDESC:

DETD(44)

The . . . defoamer upper support member 316, which, in turn, is bonded to a downwardly extending cylindrical boss 317 in the top **cap** 290; and a lower cylindrical **flange** 318 extending downardly from the defoamer lower support member 309. Both the cloth 312 and the defoamer 300 are advantageously. . .

US PAT NO: 4,065,264 [IMAGE AVAILABLE] L6: 9 of 10

US-CL-CURRENT: **422/46**; 128/DIG.3; 165/1, 163, 184; 607/106

DETDESC:

DETD(37)

Another . . . and a necked-in portion 185 at its bottom including a cylindrical flange 187 surrounding a central aperture 189. This cylindrical **flange** of the end **cap** 179 is sized to mate with the external diameter of a cylinder 191 and bonded thereto with a suitable material. . .

US PAT NO: 3,807,958 [IMAGE AVAILABLE] L6: 10 of 10
US-CL-CURRENT: **422/46**; 55/255, 256; 128/DIG.3; 261/122.1, 124; **422/47**; 607/106

DETDESC:

DETD(9)

Referring . . . 88, provides a top closure for the device 70. The return shell cap terminus 88 has an integral annular indexing **flange** 107 extending normally from the **cap** 88, with an integral vertical support ring 110 formed thereon. The filter cloth 91, which is exteriorly supportively disposed on. . .
=>

1. 5,358,689, Oct. 25, 1994, Hollow fiber blood oxygenator; Kenneth A. Jones, et al., **422/46**; 95/45, 54; 96/7, 10; 210/321.74, 321.81, 321.83, 321.88, 321.9; **422/48** [IMAGE AVAILABLE]

2. 5,240,677, Aug. 31, 1993, Hollow fiber blood oxygenator; Kenneth A. Jones, et al., **422/46**; 55/267; 128/DIG.3; 210/321.74, 321.79, 321.83, 321.88, 487, 497.1; 261/DIG.28; **422/48** [IMAGE AVAILABLE]

3. 5,234,663, Aug. 10, 1993, Hollow fiber blood oxygenator; Kenneth A. Jones, et al., **422/46**; 95/46; 96/6, 7; 128/DIG.3; 210/321.79, 321.88, 487, 497.1; 261/DIG.28; **422/48** [IMAGE AVAILABLE]

4. 5,158,533, Oct. 27, 1992, Combined cardiotomy/venous/pleural drainage autotransfusion unit with filter and integral manometer and water seal; Brian Strauss, et al., 604/4; **422/46**, **47**, **48**; 604/6, 319, 321, 403 [IMAGE AVAILABLE]

5. 5,124,127, Jun. 23, 1992, Hollow fiber blood oxygenator; Kenneth A. Jones, et al., **422/46**; 95/51; 96/6; 128/DIG.3; 210/321.74, 321.79, 321.83, 321.88, 487, 497.1; 261/DIG.28; **422/48** [IMAGE AVAILABLE]

6. 4,182,739, Jan. 8, 1980, Blood oxygenator; Robert M. Curtis, **422/47**; 128/DIG.3; 435/2 [IMAGE AVAILABLE]

7. 4,138,464, Feb. 6, 1979, Blood oxygenator with integral heat exchanger; John E. Lewin, **422/46**; 128/DIG.3; 165/133; **422/47** [IMAGE AVAILABLE]

8. 4,138,288, Feb. 6, 1979, Method and apparatus for oxygenating and regulating the temperature of blood; John E. Lewin, 435/2; 128/DIG.3; 165/1, 163, 184; **422/46**, **47** [IMAGE AVAILABLE]

9. 4,065,264, Dec. 27, 1977, Blood oxygenator with integral heat exchanger for regulating the temperature of blood in an extracorporeal circuit; John Edward Lewin, **422/46**; 128/DIG.3; 165/1, 163, 184; 607/106 [IMAGE AVAILABLE]

10. 3,807,958, Apr. 30, 1974, A BUBBLE OXYGENERATOR INCLUDING A BLOOD FOAM RETURN EXCHANGER DEVICE; Robert C. Brumfield, et al., **422/46**; 55/255, 256; 128/DIG.3; 261/122.1, 124; **422/47**; 607/106 [IMAGE AVAILABLE]

whenever the fluid pressure exceeds a predetermined value. The assembly unit is complete unto itself, but when assembled with the other **filter** components support and center one end of the **filter** element and also center and align an associated check valve in cooperation with the **filter** end closure.

SUMMARY:

BSUM(3)

This invention relates generally to **filter** relief valves and especially to a unit assembly type device which may be used with various types of filters of. . .

SUMMARY:

BSUM(5)

A common problem with known type relief valve assemblies for use with **filter** elements and especially of the throw-away type is that the relief valve assembly are unduly complicated, require close assembly tolerances,. . .

SUMMARY:

BSUM(10)

The patent to Bumb, U.S. Pat. No. 3,984,318, granted on Oct. 5, 1976, shows a sub-assembly for use with an oil **filter** wherein a Belleville spring by-pass valve is in combination with a rubber antidrainback valve. Again, this structure is far more. . .

SUMMARY:

BSUM(13)

An . . . to provide a relief valve assembly which may be used in many different applications, especially for use with a fluid **filter** of the throw-away type.

SUMMARY:

BSUM(14)

Another . . . easy to assemble relief valve unit which may be quickly and easily mounted within the center tubular portion of a **filter** element to function as a support for this end of the **filter** element as well as a relief valve to permit fluid upon reaching a predetermined pressure to bypass the **filter** element entirely.

SUMMARY:

BSUM(15)

A further object of the present invention is to provide a **filter** element relief valve sub-assembly which may be used for both supporting and aligning the **filter** element as well as aligning an associated check valve structure in conjunction with the end closure member for the

overall **filter** shell.

SUMMARY:

BSUM(18)

In one application of this relief valve assembly, it is used in combination with an oil **filter** cartridge of the conventional throw-away type, wherein the sub-assembly is centered within the central tubular area of the **filter** element and firmly engaged therewith in a fluid-tight manner. The outward radial flange of the first annular support member is used to engage with and support the paper end disc as associated with the **filter** element.

SUMMARY:

BSUM(19)

An . . . with said pressure spring ring being centrally aligned, held, and spaced by this recessed shoulder of the assembly. During overall **filter** manufacture, when the end enclosure portion of the **filter** is attached to the outer consister shell, the check valve gasket and spring assembly are simultaneously centered and aligned because. . .

SUMMARY:

BSUM(20)

Another . . . first support member outwardly a sufficient distance to function and replace the paper end disc as normally associated with the **filter** element. An upwardly extending or axially extending edge flange provides a full metal end cap for the **filter** element, and greatly improves the overall supporting and aligning function of the relief valve assembly.

DRAWING DESC:

DRWD(2)

FIG. 1 is a side elevational view, partly in cross section, of an oil **filter** having the relief valve assembly of this invention combined therewith.

DRAWING DESC:

DRWD(5)

FIG. 4, is a perspective view of a modification of the **filter** element contacting portion of the relief valve assembly of this invention.

DETDESC:

DETD(2)

Looking at FIG. 1 of the drawings, reference numeral 10 indicates in general the throw-away type oil **filter** cartridge with which the

relief valve assembly of this invention may be used. A cylindrical canister 12 having a closed end 13 with **filter** element aligning end supporting structure 15 together with end cap 17 supports one end of the **filter** element 14. The **filter** element 14 has a central tubular portion 16 provided with fluid flow apertures 18. The open end of the cylindrical. . . provided circumferentially around a central fluid outlet aperture 22. This aperture 22 is normally internally threaded for screwing the overall **filter** cartridge upon a complementary projecting threaded stud on an engine. Another separate plate 24 having corresponding apertures therein to those. . .

DETDESC:

DETD(3)

The . . . normal flow of the fluid into the inlet holes 21 and through the inside of the canister housing through the **filter** element 14, into the center of tube 16, and out through opening 22, back to the engine or other device with which the **filter** is being used. Generally, the flow lines indicated by B indicate the bypass function of this relief valve sub-assembly whenever the **filter** element 14 becomes sufficiently clogged to prevent pass of fluid therethrough, and/or if the fluid itself should be of such thickness and consistency as not to readily flow through the **filter** element. That is the relief valve will allow fluid to bypass the **filter** and return through opening 22 back to the engine in the same manner as already described.

DETDESC:

DETD(8)

Another . . . provides support for associated check valve structure, if desired, when the unit is mounted as in FIG. 1 with a **filter** cartridge structure. As thus seen in FIG. 1, a metal spring member 70 is centered and aligned by means of. . .

DETDESC:

DETD(9)

Another . . . in FIG. 1. The radial flange 34' is of sufficient size to completely cover the associated end portion of the **filter** element 14 and also provided with an axially aligned flange 84 to complete encase and support the associated end of **filter** element 14. Much in the manner of the full metal and cap 17 for the other end of the **filter** element as seen in FIG. 1. By using this modification, the paper end disc 19 may be completely eliminated, thus reducing the number of necessary elements in the disposable oil **filter** cartridge, and thus also decreasing the assembly and overall cost.

CLAIMS:

CLMS(1)

We claim:

1. A fluid **filter** having a fluid-tight canister having a cylindrical **filter** element contained therein, said **filter** element having a

center tube therein, a closure disc at one end of the canister having a fluid inlet and fluid outlet therethrough, the improvement comprising:
means for engagement with said **filter** element mountable within one end of the center tube thereof, additional means for engagement and alignment with said closure disc. . . flow through associated openings thereof, and further means associated with the aforesaid means for permitting fluid flow to bypass said **filter** element when pressure of said fluid exceeds a predetermined given amount, the means for engagement with said **filter** element including an axially extending tubular member having a radially inwardly extending flange formed with a preset angle with respect. . . tubular member having a rolled inner end flange abutting against the gasket member on the opposite side thereof from the **angled** **flange** in order to pre-stress the conical gasket member against the pressure of fluid.

CLAIMS:

CLMS(5)

5. A fluid **filter** having a fluid-tight canister having a cylindrical **filter** element contained therein, said **filter** element having a center tube therein, a closure disc at one end of the canister having a fluid inlet and fluid outlet therethrough, the improvement comprising:
means for engagement with said **filter** element mountable within one end of the center tube thereof, additional means for engagement and alignment with said closure disc. . . flow through associated openings thereof, and further means associated with the aforesaid means for permitting fluid flow to bypass said **filter** element when pressure of said fluid exceeds a predetermined given amount, all of the aforesaid means being combined in a simple, easy to assemble, completly unitized structure for effecting said aforesaid function;
the means for engagement with said **filter** element including an axially extending tubular member having a radially inwardly extending flange formed with a preset angle with respect. . . substantially perpendicular to the center line of said tubular member;
said radially outwardly extending flange engaging with one end of said **filter** element and further extending beyond the outer circumference thereof, and being further provided with an axially extending circumferential flange so as to function as a full end cap for said **filter** element.

CLAIMS:

CLMS(6)

6. A fluid **filter** having a fluid-tight canister having a cylindrical **filter** element contained therein, said **filter** element having a center tube therein, a closure disc at one end of the canister having a fluid inlet and fluid outlet therethrough, the improvement comprising:
means for engagement with said **filter** element mountable within one end of the center tube thereof, additional means for engagement and alignment with said closure disc. . . flow through associated openings thereof, and further means associated with the aforesaid means for permitting fluid flow by pass said **filter** element when pressure of said fluid exceeds a predetermined given amount, all of the aforesaid means being combined in a. . .

CLAIMS:

CLMS(9)

9. A valve assembly for a fluid **filter** device comprising:
means for providing simple, minimum element, easy to assemble, completely independent valve structure for use with a fluid flow **filter** device including;
first support means for direct contact with a fluid **filter** element,
second support means for association with fluid flow input and output means,
and third means of special configuration retained between said. . .

CLAIMS:

CLMS(10)

10. . . . the tubular member provides a shoulder which functions as an aid in rapid assembly of the unit within an associated **filter** element and also forms a sealing portion in conjunction with the fluid flow permitting means.

CLAIMS:

CLMS(11)

11. . . . the tubular member provides a shoulder which functions as an aid in rapid assembly of the unit within an associated **filter** element and also forms a sealing portion in conjunction with the fluid flow permitting means.

CLAIMS:

CLMS(12)

12. A valve assembly for a fluid **filter** device comprising:
means for providing simple, minimum element, easy to assemble, completely independent valve structure for use with a fluid flow **filter** device including;
first support means for direct contact with a fluid **filter** element,
second support means for association with fluid flow input and output means,
third means of special configuration retained between said first. . .

CLAIMS:

CLMS(18)

18. A valve assembly for a fluid **filter** device comprising:
means for providing simple, minimum element, easy to assemble, completely independent valve structure for use with a fluid flow **filter** device including;
first support means for direct contact with a fluid **filter** element,
second support means for association with fluid flow input and output means,
and third means of special configuration retained between said. . . the tubular member providing a shoulder which functions as an aid in rapid assembly of the unit within an associated **filter** element and also forms a sealing portion in conjunction with the fluid flow

permitting means, and
said outer tubular member being. . .

CLAIMS:

CLMS(21)

21. An oil **filter** device of the throw-away type for use with automobiles engines and the like comprising:
a canister shell having an open end, a **filter** element mounted within said canister shell and supported at the closed end thereof by end cap support structure, a closure. . . disc configuration enclosing said open end of said canister shell and provided with an inlet for delivering oil to said **filter** element and an outlet for receiving filtered oil from said **filter** element, and a **filter** relief valve sub-assembly mounted within said canister between said **filter** element and said closure disc, the improvement comprising said **filter** relief valve sub-assembly having a central tubular portion for permitting oil flow therethrough, one end of said central tubular member. . .

CLAIMS:

CLMS(22)

22. . . . with said further tubular member being provided with a radially extending flange for contact with the associated end of said **filter** cartridge.

US PAT NO: 4,033,733 [IMAGE AVAILABLE] L5: 5 of 6
TITLE: Air **filter** gauge
US-CL-CURRENT: 55/274; 73/38; 116/268; **210/90**; 340/607

ABSTRACT:
A gauge detecting the presence of a restriction placed upon an air stream passing through a **filter** in connection with an internal combustion engine, said gauge including a linear indicator to show the relative restriction present in the **filter** and including an indicator to show that the **filter** requires cleaning or replacement.

SUMMARY:

BSUM(2)

The device herein is used in connection with an air **filter** for an internal combustion engine. Said device indicates by a visible linear indication the accumulation of contaminants present in the **filter** placing restriction upon the air stream passing through the **filter** and said device further shows when the air **filter** has become loaded with such an accumulation of contaminants that an air stream or the combustion air can no longer in sufficient quantity pass through the **filter** to supply the requirement for air for efficient operation of the engine.

SUMMARY:

BSUM(3)

The device herein gives a continuous reading to indicate the build up of contaminants within an air **filter** to inform visibly how much usefulness is left in the air **filter**. The device herein does away with guess work as to the time when cleaning or replacement of the air **filter** is necessary and provides for maximum use of an air **filter**.

SUMMARY:

BSUM(5)

It . . . a device which gives a positive indication by a visible reading of the need for cleaning or replacing an air **filter**.

SUMMARY:

BSUM(6)

It is another object of this invention in connection with an air **filter** for an internal combustion engine to give a continuous visual reading of the condition of an air **filter** by a visible reading of a linear indicator.

SUMMARY:

BSUM(8)

It . . . this invention to provide a device to detect the restriction being placed upon an air stream passing through an air **filter** which device comprises a housing having a linear moveable indicating member therein bearing a readily seen color to indicate the relative condition of an air **filter** as to the build up of contaminants therein and as to the restriction being placed on an air stream passing therethrough and also having a readily seen indicating member which indicates that the air **filter** for practical purposes may be regarded as being fully restricted with respect to the further passage of air therethrough in. . . in an internal combustion engine, said device having a diaphragm therein adjusted for a normal operating condition as with the **filter** free from contamination, to provide a balance between the atmospheric pressure upon one side thereof and the partial vacuum drawn. . .

DETDESC:

DETD(2)

Referring to the drawings, the device 10 forming an air **filter** restriction detection device and comprising the subject matter of the invention herein is shown in operating position connected by a. . . for communication with the air stream 15, indicated by arrows, passing through the air stack 16 extending from the air **filter** 17 to the air intake 18 of an internal combustion engine 20 which is merely indicated here by a fragmentary. . .

DETDESC:

DETD(5)

Forming . . . bottom wall 51 of said recess having a passage 53

therethrough. Seated in said recess and removeably secured therein is **filter** member 55 sufficiently porous for the free passage of air therethrough.

DETDESC:

DETD(6)

The side wall 44 of said member 40 terminates in a right **angled** **flange** 56 of a diameter to fit within said angled shoulder 37 as shown.

DETDESC:

DETD(9)

Seated . . . member or indicator which by its vertical position indicates the amount of restriction or degree of contamination in the air **filter**. The bottom of said member 75 has a substantially narrower width than the underlying wall portion of said diaphragm.

DETDESC:

DETD(14)

Integral . . . the colored rim portion 78 and the colored band 98, the means used to indicate the condition of the air **filter** being used. Notches 104 are formed at each side edge portion of said mounting plate to accommodate appropriate fastening means. . .

DETDESC:

DETD(16)

FIG. 4 illustrates the device in its operating position showing no restriction of the air stream passing through said **filter** 17. There is a normal restriction of air passing through a clean **filter** and adjustment is made for this in the device by calibrating the tension of the spring 95 to balance said. . .

DETDESC:

DETD(18)

Thus . . . increments of change in the vacuum drawn on the chamber 28 caused by the degree of restriction in said air **filter** 17. In use, the increments of restriction may be indicated by hair lines across the face of the transparent portion. . .

DETDESC:

DETD(19)

As restriction builds up in the air **filter** 17 by the accumulation of contaminants therein, the flow of the stream of combustion air 15 therethrough will decrease with. . . the rim 78 of the indicating member 75 will move upwardly to indicate the presence of restriction in

the air **filter**. The operator can estimate the useful extent of the **filter** 17 by the space between the rim 78 and the band 98. As indicated above, calibration lines may be applied. . .

DETDESC:

DETD(20)

When the rim 78 has moved upwardly as in FIG. 5 to become shielded by the band 97, then the **filter** 17 requires cleaning or replacement as the case may be.

DETDESC:

DETD(21)

At the beginning of a days work, upon starting up the engine, the operator can readily determine whether or not the **filter** will require attention and thus work stoppage during the course of the day can be avoided. The device as described. . .

DETDESC:

DETD(23)

Referring . . . electrical circuit to the device to energize and actuate a signal to audibly and/or visually alert the operator that the **filter** requires attention for cleaning or replacement.

DETDESC:

DETD(28)

The . . . is so arranged that when the indicator cup 75 is at the point of indicating a full restriction in the **filter** 17, that at such time the coil 95b of said spring 95 will come into contact with the depending portion. . .

CLAIMS:

CLMS(1)

What is claimed is:

1. An air **filter** restriction indicating device, having in combination
a housing having a top and bottom wall and having in upstream connection therewith an air **filter** having an air stream passing to the air intake of an engine,
an inverted cup shaped diaphragm disposed within said housing. . . the underlying wall portion of said diaphragm,
a passage through said housing at one end thereof connected downstream of the air **filter** providing communication with said indicating member and said air stream,
a passage through said housing at the other end thereof providing. . . housing holding the same in nested position within said diaphragm with said diaphragm in infolded position and with said air **filter** in a clean operating position, said spring means having a compressive force

such as to represent the differential between the. . . visible through said transparent wall portion and having linear movement to show the progressive condition of restriction of said air **filter**, said non-transparent annular wall portion being positioned to have said rim portion in register therewith and to shield the same to indicate a full restriction of said air **filter**, and said spring means moving said indicating member in a restriction indicating position only with an air stream passing to the. . .

CLAIMS:

CLMS(2)

2. . . .
sensitive to small increments of change in the vacuum drawn on the chamber thereabove caused by restrictions in said air **filter**.

CLAIMS:

CLMS(3)

3. . . .
circuit when said spring is compressed to the point that said indicating member indicates a full restriction of said air **filter**.

US PAT NO: 3,719,278 [IMAGE AVAILABLE] L5: 6 of 6
US-CL-CURRENT: **210/169**

ABSTRACT:
An external **filter** for cleaning the water of an aquarium, wherein water is extracted from the aquarium and supplied to an inlet chamber from which it flows through a **filter** chamber to an outlet chamber which is fitted with a tube extending downwards from the bottom of the chamber, the. . . into the aquarium. As an alternative, the inlet, which preferably functions with a siphonic action, may open directly into the **filter** chamber from which it flows into two outlet chambers each of which is provided with a similar gas lift device. . .

SUMMARY:

BSUM(2)

Both . . . filters are known for filtering aquarium water, a motor driven water pump being provided for circulating the water through the **filter**. Filters of this kind, equipped with a motor driven water pump, are dangerous due to the risk of water coming. . .

SUMMARY:

BSUM(4)

With the aim of providing an air driven external **filter** for cleaning the water of an aquarium which has better water circulation than is known at present, according to the invention an external **filter** comprises an inlet for supplying water to be filtered from an aquarium to the **filter**, a **filter** chamber, and a pair of other chambers which communicate with the **filter** chamber to allow passage of water between the **filter** chamber and each of the other chambers, at least one of

the other chambers forming an outlet chamber for filtered. . .

SUMMARY:

BSUM(5)

Preferably . . . opens the inlet for supplying water from the aquarium, this water, in use, flowing from the inlet chamber into the **filter** chamber where it is filtered before flowing on into the outlet chamber for return to the aquarium. Such a **filter** is simple in construction and is easily maintained, and furthermore may easily be equipped if desired with a controlled heating system. The water is circulated from the aquarium through the **filter** and back to the aquarium just as energetically as if an electrically driven water pump is used, and the air. . .

SUMMARY:

BSUM(7)

Preferably . . . tube of greater height increases the conveying effect, that is to say the water is circulated more rapidly. The same **filter** can therefore be used for aquaria of different dimensions, the rate of water circulation being adjusted in each case, to. . . requirements, merely by telescopically adjusting the length of the double tube air lift, no modification of the rest of the **filter** being necessary.

SUMMARY:

BSUM(11)

For . . . has its end immersed in the water in the aquarium and the other arm projects into the water in the **filter**, preferably into the inlet chamber. At its highest point, i.e. at the U-bend, the siphon may be equipped with a. . .

SUMMARY:

BSUM(12)

The **filter** in accordance with the invention is designed for easy accessibility and easy maintenance and in this respect the chambers are preferably formed within a housing, the **filter** chamber being enclosed by three transverse separator plates which extend between the side walls of the housing, one of the. . . terminating with its lower edge spaced above the bottom of the housing this lower edge of the plate having an **angled** **flange** which supports a second of the plates which forms the bottom of the **filter** chamber, these two plates separating the **filter** chamber from the outlet chamber. The first and third separator plates are vertical and may be positioned by guide rails which are formed integrally with the side walls of the housing. With this arrangement the **filter** chamber, which may for example contain cotton wool as a filtering medium, is easily accessible and can easily be dismantled for cleaning. The **filter** plate, i.e. the second separator plate, is simply lifted out and the two vertical plates are lifted out from their. . .

SUMMARY:

BSUM(13)

Preferably, the third separator plate separates the inlet chamber from the **filter** chamber and extends upwards from the bottom of the housing terminating short of the top of the housing so that,. . . in use, the upper edge of the plate forms a weir for water passing from the inlet chamber to the **filter** chamber. The **filter** plate, which supports the filtering medium, has perforations to allow passage of the filtered water, and the first separator plate, which separates the **filter** chamber from the outlet chamber, may have perforations only in its lower part, that is to say only up to. . .

SUMMARY:

BSUM(14)

In . . . from the aquarium water to the ambient atmosphere, and to moderate the noise made by the water flowing through the **filter** chambers, the housing may be equipped with a cover of U-shaped cross section, having lateral openings to accommodate the siphon and the overflow channel. The cover also serves to trap any spray issuing from the **filter** housing. In order to facilitate cleaning or replacement of parts, the interior of the cover is equipped with integral cross. . .

SUMMARY:

BSUM(15)

When the external **filter** is in use, it is preferably, attached to a wall of the aquarium. For this purpose a side wall of. . . upper edge of the aquarium. A locking screw passes through the bent down edge of the flange to secure the **filter** to the wall of the aquarium.

SUMMARY:

BSUM(16)

The . . . tank and therefore, in the present case both the thermostat and the heating device are preferably accommodated in the external **filter**, the thermostat being installed in the inlet chamber and the heating device in the outlet chamber. The heating device may. . . aquarium water are compensated with the least possible delay, the thermostat sensing the temperature change at the inlet of the **filter** and sending a signal to the heating device, which heats the water on its way back to the aquarium. The. . .

SUMMARY:

BSUM(18)

The **filter** in accordance with the invention may with advantage be arranged in such a way that the inlet siphon opens into the **filter** chamber, both of the other two chambers forming outlet chambers each equipped with a double tube air lift with a superposed overflow channel. This arrangement allows two aquaria to be supplied simultaneously with filtered water by a single **filter**. Alternatively if desired filtered

water can be supplied to a single aquarium at two different locations. This can be an. . .

SUMMARY:

BSUM(19)

The external **filter** in accordance with the invention is outstanding not only due to its particularly simple construction, and consequent reliability in operation, but also because it allows water to be circulated at approximately twice the rate in comparison with common **filter** systems which use motor driven water pumps, with only 4 percent of the power consumption.

DRAWING DESC:

DRWD(1)

An example of an external **filter** in accordance with the present invention is illustrated in the accompanying drawings, in which:

DRAWING DESC:

DRWD(2)

FIG. 1 is a diagrammatical longitudinal section through the **filter**;

DRAWING DESC:

DRWD(3)

FIG. 2 is a plan view of the **filter**; and,

DETDESC:

DETD(1)

The **filter** shown in the drawings has a rectangular box housing 1 which is open at the top. The side walls 2. . . for two separator plates 5 and 6 which divide the housing 1 into three chambers, an inlet chamber 7, a **filter** chamber 8 and an outlet chamber 9. The guide rails 3, 4 are formed integrally with the walls of the. . . is preferably injection moulded from a plastics material. The separator plate 5, which separates the inlet chamber 7 from the **filter** chamber 8, extends from the bottom of the housing upwards and terminates short of the top of the housing. In use water which enters the inlet chamber 7 must flow over the plate 5 into the **filter** chamber 8 and the plate 5 therefore acts as a baffle or a weir plate. On the other hand the separator plate 6, which separates the **filter** chamber 8 from the outlet chamber 9, extends downwards from the top of the housing 1 and terminates short of the bottom of the housing, and thus water has to flow under the separator plate 6 from the **filter** chamber 8 to the outlet chamber 9. The lower edge of the separator plate 6 is angled inwards towards the **filter** chamber 8, as shown at 10. The angled edge 10 supports an inclined **filter** plate 11 which forms the base of the **filter** chamber 8. Below the plate 11 is a wedge shaped chamber which forms part of the outlet chamber 9. The **filter** plate 11 and the separator plate 6 have openings 12, 13 through which the filtered water

can pass from the **filter** chamber 8 into the outlet chamber 9. The openings 13 in the separator plate 6 are limited to the lower. . .

DETDESC:

DETD(4)

Above . . . which projects upwards to above the floor of the catchment tank 26. The protein foam trap is necessary when the **filter** is used with a seawater aquarium since usually a certain amount of foam is produced. The foam rises upwards through. . .

DETDESC:

DETD(7)

The . . . of the housing by clips or holders 39, 40. The thermostat 38 senses the temperature of the water entering the **filter** from the aquarium and on falling to a set value the thermostat 38 sends out a signal which activates the heater 37 to heat the water leaving the **filter**. There is therefore little or no time delay, that is to say as soon as the water leaving the aquarium. . .

DETDESC:

DETD(8)

The upper edge of the housing has an L-shaped flange 41 for attachment of the **filter** to the upper edge of an aquarium wall, by means of a clamping screw 42.

DETDESC:

DETD(9)

This example of an external aquarium **filter** in accordance with the invention functions as follows. After attaching the **filter** to the aquarium, and filling the housing with water to the desired level, the siphon duct 28 is brought into. . .

DETDESC:

DETD(10)

During operation of the **filter** the water level is highest in the inlet chamber 7, somewhat lower in the **filter** chamber 8 and lowest in the outlet chamber 9.

CLAIMS:

CLMS(1)

I claim:

1. An external **filter** for cleaning the water of an aquarium, including inlet means for supplying water to be filtered from said aquarium to said **filter**, a housing, means within said housing defining a **filter** chamber and a pair of other chambers which

communicate with said **filter** chamber to allow passage of water between said **filter** chamber and each of the other of said chambers, at least one of said other chambers being adapted to form. . . two chambers being adapted to form an inlet chamber and said inlet means is connected to said inlet chamber, said **filter** including means for ensuring that water supplied by said inlet means from said aquarium flows from said inlet chamber into said **filter** chamber where it is filtered before flowing on to said outlet chamber for return to said aquarium, the said means defining said **filter** chamber comprising opposed side walls of said housing, and three transverse separator plates extending between said opposed side walls, one. . . top of said housing, a lower edge on said one separator plate spaced above the bottom of said housing, an **angled** **flange** mounted at said lower edge of said one plate, and a second of said three transverse separator plates being supported on said **angled** **flange** and forming the bottom of said **filter** chamber, said first and second separator plates separating said **filter** chamber from said outer chamber.

CLAIMS:

CLMS(2)

2. An external **filter** as claimed in claim 1, wherein said second separator plate which forms the bottom of said **filter** chamber is perforated.

CLAIMS:

CLMS(3)

3. An external **filter** as claimed in claim 1, wherein the third of said three transverse separator plates separates said inlet chamber from said **filter** chamber and extends upwards from the bottom of said housing, a top edge of said third separator plate being spaced. . . said housing whereby in operation said top edge forms a weir for water passing from said inlet chamber to said **filter** chamber.

CLAIMS:

CLMS(4)

4. An external **filter** as claimed in claim 3, wherein the lower part of said first separator plate is provided with means defining a. . .

CLAIMS:

CLMS(5)

5. An external **filter** as claimed in claim 3, wherein said opposed side walls of said housing are provided with integrally formed guide rails. . .

CLAIMS:

CLMS(6)

6. An external **filter** for cleaning the water of an aquarium, including inlet means for supplying water to be filtered from said

aquarium to said **filter**, a housing, means within said housing defining a **filter** chamber and a pair of other chambers which communicate with said **filter** chamber to allow passage of water between said **filter** chamber and each of the other of said chambers, at least one of said other chambers being adapted to form. . .

```
=> s flange(5a)cap and 422/46-48/cclst
        249286 FLANGE
        148713 CAP

          7533 FLANGE(5A)CAP
           352 422/46-48/CCLST  (3 TERMS)
                 (422/46+NEXT2/CCLST)
L6          10 FLANGE(5A)CAP AND 422/46-48/CCLST
=> d l6 1-10
```

1. 5,358,689, Oct. 25, 1994, Hollow fiber blood oxygenator; Kenneth A. Jones, et al., **422/46**; 95/45, 54; 96/7, 10; 210/321.74, 321.81, 321.83, 321.88, 321.9; **422/48** [IMAGE AVAILABLE]

2. 5,240,677, Aug. 31, 1993, Hollow fiber blood oxygenator; Kenneth A. Jones, et al., **422/46**; 55/267; 128/DIG.3; 210/321.74, 321.79, 321.83, 321.88, 487, 497.1; 261/DIG.28; **422/48** [IMAGE AVAILABLE]

3. 5,234,663, Aug. 10, 1993, Hollow fiber blood oxygenator; Kenneth A. Jones, et al., **422/46**; 95/46; 96/6, 7; 128/DIG.3; 210/321.79, 321.88, 487, 497.1; 261/DIG.28; **422/48** [IMAGE AVAILABLE]

4. 5,158,533, Oct. 27, 1992, Combined cardiotomy/venous/pleural drainage autotransfusion unit with filter and integral manometer and water seal; Brian Strauss, et al., 604/4; **422/46**, **47**, **48**; 604/6, 319, 321, 403 [IMAGE AVAILABLE]

5. 5,124,127, Jun. 23, 1992, Hollow fiber blood oxygenator; Kenneth A. Jones, et al., **422/46**; 95/51; 96/6; 128/DIG.3; 210/321.74, 321.79, 321.83, 321.88, 487, 497.1; 261/DIG.28; **422/48** [IMAGE AVAILABLE]

6. 4,182,739, Jan. 8, 1980, Blood oxygenator; Robert M. Curtis, **422/47**; 128/DIG.3; 435/2 [IMAGE AVAILABLE]

7. 4,138,464, Feb. 6, 1979, Blood oxygenator with integral heat exchanger; John E. Lewin, **422/46**; 128/DIG.3; 165/133; **422/47** [IMAGE AVAILABLE]

8. 4,138,288, Feb. 6, 1979, Method and apparatus for oxygenating and regulating the temperature of blood; John E. Lewin, 435/2; 128/DIG.3; 165/1, 163, 184; **422/46**, **47** [IMAGE AVAILABLE]

9. 4,065,264, Dec. 27, 1977, Blood oxygenator with integral heat exchanger for regulating the temperature of blood in an extracorporeal circuit; John Edward Lewin, **422/46**; 128/DIG.3; 165/1, 163, 184; 607/106 [IMAGE AVAILABLE]

10. 3,807,958, Apr. 30, 1974, A BUBBLE OXYGENERATOR INCLUDING A BLOOD FOAM RETURN EXCHANGER DEVICE; Robert C. Brumfield, et al., **422/46**; 55/255, 256; 128/DIG.3; 261/122.1, 124; **422/47**; 607/106 [IMAGE AVAILABLE]

```
=> d kwic 1-10
```

US PAT NO: 5,358,689 [IMAGE AVAILABLE] L6: 1 of 10
US-CL-CURRENT: **422/46**; 95/45, 54; 96/7, 10; 210/321.74, 321.81, 321.83, 321.88, 321.9; **422/48**

DETDESC:

DETD(40)

The **cap** 52 has a downwardly depending **flange** 109 which forms a circular hole or aperture 108 in the center of the cap 52 (FIG. 3). There are. . .

DETDESC:

DETD(41)

The outer periphery of the outer casing **cap** 52 also has a depending **flange** 110 (FIG. 5) substantially parallel to the longitudinal axis of aperture 108. The flange 110 corresponds to the shape of. . .

DETDESC:

DETD(52)

The . . . inside of the enclosed heat exchanger unit 56. Similarly, the O-ring 79 on flange 78 abuts the inside of the **flange** 109 on outer casing **cap** 52. Further, the coils 16 abut the outside diameter of interior housing 20. A force is then applied to the. . .

DETDESC:

DETD(54)

The . . . flange 78 at the larger end, or top of the enclosed fiber bundle unit 54 is resiliently urged against the **flange** 109 on the end **cap** 52 of the enclosed heat exchanger unit 56. The O-ring 79 on flange 78 provides a seal between the top. . .

DETDESC:

DETD(56)

The . . . an adhesive to ensure gastight joints. Specifically, the one-way valve 69 is connected to the port 118 in the top **cap** 32. The **flange** 114 on top **cap** 32 is then inserted into the aperture 108 on the outer casing cap 52. The bayonet tabs 116 correspond with. . .

US PAT NO: 5,240,677 [IMAGE AVAILABLE] L6: 2 of 10
US-CL-CURRENT: **422/46**; 55/267; 128/DIG.3; 210/321.74, 321.79, 321.83, 321.88, 487, 497.1; 261/DIG.28; **422/48**

DETDESC:

DETD(39)

The **cap** 52 has a downwardly depending **flange** 109 which forms a circular hole or aperture 108 in the center of the cap 52 (FIG. 3). There are. . .

```
=> s angled flange
         78601 ANGLED
        249286 FLANGE

L1          544 ANGLED FLANGE
                (ANGLED(W)FLANGE)
=> s l1 and 422/44-48/cclst
            546 422/44-48/CCLST  (5 TERMS)
                (422/44+NEXT4/CCLST)
L2            1 L1 AND 422/44-48/CCLST
=> d l2

1.  5,489,413, Feb. 6, 1996, Hollow fiber blood oxygenator; Gary A.
Carson, et al., **422/46**; 210/321.76, 321.84, 645; **422/48** [IMAGE
AVAILABLE]
=> s l1 and 210/clas and (filter or exchanger) and hollow fiber#

         63348 210/CLAS
        260396 FILTER
         52391 EXCHANGER
        247396 HOLLOW
        185473 FIBER#
          4477 HOLLOW FIBER#
                (HOLLOW(W)FIBER#)
L3            1 L1 AND 210/CLAS AND (FILTER OR EXCHANGER) AND HOLLOW FIBER#
=> d l3

1.  5,489,413, Feb. 6, 1996, **Hollow** **fiber** blood oxygenator; Gary
A. Carson, et al., 422/46; **210/321.76**, **321.84**, **645**; 422/48
[IMAGE AVAILABLE]
=> s l1 and 210/clas
         63348 210/CLAS
L4           11 L1 AND 210/CLAS
=> s l4 and (filter or exchanger)
        260396 FILTER
         52391 EXCHANGER

L5            6 L4 AND (FILTER OR EXCHANGER)
=> d l5 1-6

1.  5,489,413, Feb. 6, 1996, Hollow fiber blood oxygenator; Gary A.
Carson, et al., 422/46; **210/321.76**, **321.84**, **645**; 422/48
[IMAGE AVAILABLE]

2.  5,106,500, Apr. 21, 1992, Portable water purification system
including a **filter** cleaning mechanism; Richard D. Hembree, et al.,
**210/266**, **276**, **282**, **414**, **415**, **416.3**, **764**
[IMAGE AVAILABLE]

3.  4,268,925, May 26, 1981, Sewage treatment system; Elwood Marple,
4/449, 111.6, 459, DIG.12; **210/199** [IMAGE AVAILABLE]

4.  4,127,484, Nov. 28, 1978, **Filter** relief valve assembly; Albert B.
Walulik, et al., **210/130**, **168**, **440** [IMAGE AVAILABLE]

5.  4,033,733, Jul. 5, 1977, Air **filter** gauge; Richard D. Nelson,
55/274; 73/38; 116/268; **210/90**; 340/607 [IMAGE AVAILABLE]
```

6. 3,719,278, Mar. 6, 1973, EXTERNAL FILTERS FOR AQUARIA; Erwin Kolfertz, **210/169** [IMAGE AVAILABLE]
=> d 2-6 kwic

US PAT NO: 5,106,500 [IMAGE AVAILABLE] L5: 2 of 6
TITLE: Portable water purification system including a **filter** cleaning mechanism
US-CL-CURRENT: **210/266**, **276**, **282**, **414**, **415**, **416.3**, **764**

ABSTRACT:
A water purification system including both a **filter** and a body of biocidally active material for microbiologically purifying biologically contaminated water. The system provides for the production of. . . upstroke and downstroke of the plunger and includes a brush which can be reciprocated within the system for cleaning the **filter**.

SUMMARY:

BSUM(2)

Broadly, the invention relates to water purification systems. Specifically, the invention relates to portable water purification systems which include a **filter** for physically removing particulate contaminants and larger pathogens from the water, a porous body of biocidally effective material for chemically disinfecting the water, and a means for cleaning the **filter** media so as to remove contaminants entrapped against the **filter**.

SUMMARY:

BSUM(8)

U.S. . . . upon the treated water contained within the first container when forced downward into the first container, and (iv) a replaceable **filter** cartridge coupled to the base of the second container for filtering the treated water retained within the first container as the water is forced from the first container into the second container. The **filter** cartridge includes a polyethylene **filter** to remove suspended solids, a layer of activated carbon to remove the biocide and other distasteful contaminants, and a layer. . .

SUMMARY:

BSUM(9)

U.S. . . . issued to Gartner, discloses a disposable, portable water purification system operable by mouth suction which comprises a straw sequentially containing **filter** media for removing suspended solids from the water, biocidally active anion exchange resin for chemically disinfecting the water, **filter** media for further removing suspended solids, activated carbon for removing distasteful contaminants including residual disinfecting chemical, and **filter** media for retaining the activated carbon. Gartner does not discuss the pore sizes of the **filter** medias.

SUMMARY:

BSUM(10)

A second method employed to microbiologically purify contaminated water attempts to **filter** the pathogens from the contaminated water by employing a **filter** having a pore size effective to remove all pathogens. While this method can be effective for removing the larger pathogens. . . . removing the smaller pathogens such as viruses, require significant operating energy, produce modest quantities of filtered water, and require frequent **filter** replacement.

SUMMARY:

BSUM(11)

U.S. Pat. Nos. 492,161, 1,130,725 and 1,510,863 disclose cleanable filtration systems which include a **filter** media and manually operable brushes for scrubbing the surface of the **filter** media in contact with the contaminated water. However, these cleanable filtration systems are not designed for use in a portable. . .

SUMMARY:

BSUM(12)

Accordingly, . . . that can produce significant quantities of microbiologically purified water with minimal effort and includes a means for efficiently cleaning the **filter** media so as to increase the useful life of the system without replacing the **filter**.

DETDESC:

DETD(2)

An apparatus for producing potable water from contaminated water which includes (i) a primary container defining a primary chamber, (ii) a **filter** sealingly dividing the primary chamber into a first cavity and a second cavity with a first surface of the **filter** facing the first cavity and a second surface of the **filter** facing the second cavity, (iii) a means for brushing the first surface of the **filter** so as to remove contaminants entrapped against the first surface of the **filter**, and (iv) a manually operable plunger reciprocally and sealingly retained within the first cavity wherein the plunger is operable in a first operational mode for forcing contaminated water retained within the first cavity through the **filter**, and operable in a second operational mode for activating the brushing means for removing contaminants entrapped against the first surface of the **filter**.

DETDESC:

DETD(3)

The . . . of the plunger when in the first operational mode does not activate the brushing means for removing contaminants from the **filter** and reciprocation of the plunger when in the second operational mode preferentially directs the contaminated water containing the contaminants removed from the first surface of the **filter** directly out of the apparatus rather than through the **filter**.

DETDESC:

DETD(4)

The . . . body of biocidally effective material operably positioned within the second cavity for disinfecting the filtered water. Such a combination of **filter** media and biocidally effective material is capable of providing microbiologically purified water using a macroporous **filter** media as the **filter** media need only remove suspended solids and the larger pathogens such as cysts which are substantially resistant to chemical disinfection.

DETDESC:

DETD(6)

The . . . contaminated with suspended solids and/or pathogens. The system includes a means for cleaning the contaminated water contacting surface of the **filter** media so as to release and remove contaminants entrapped against the **filter** and thereby increase the useful life of the **filter**.

DETDESC:

DETD(88)
500: **filter** media

DETDESC:

DETD(89)
501: top of **filter** media

DETDESC:

DETD(90)
502: bottom of **filter** media

DETDESC:

DETD(91)
503: inner surface of **filter** media

DETDESC:

DETD(92)
504: outer surface of **filter** media

DETDESC:

DETD(98)

The system 100 includes (i) a cylindrical primary container 200 which accommodates a cylindrical **filter** 500 and a porous body of biocidally effective material 600, (ii) a cylindrical secondary container 300 reciprocally and sealably retained. . . of contaminated water (not shown) to be purified and including bristles 350 for brushing the inner surface 503 of the **filter** 500 when the secondary container 300 is reciprocated within the primary container 200, and (iii) a plunger 400

reciprocally and. . . water into the secondary container 300 and for forcing the contaminated water drawn into the secondary container 300 through the **filter** 500 and the porous body of biocidally effective material 600.

DETDESC:

DETD(105)

A cylindrical **filter** 500 is accommodated within the upper portion 280a of the primary chamber 280. The top 501 and bottom 502 of the **filter** 500 are sealingly coupled to the upper inner annular horizontal flange 231 and the top 241 of the retainer 240, respectively. The **filter** 500 separates the upper portion 280a of the primary chamber 280 into a primary central cylindrical cavity 281 and an. . .

DETDESC:

DETD(106)

The inner surface 503 of the **filter** 500 and the inner surface 244 of the retainer 240 are vertically aligned so that the primary central cylindrical cavity. . .

DETDESC:

DETD(112)

A . . . secondary container 300 and an inner annular cavity 361 between the sidewall 303 of the secondary container 300 and the **filter** 500.

DETDESC:

DETD(123)

The . . . 363 in the sidewall 303 of the secondary container 300, [dd] into the inner annular cavity 361, [ee] through the **filter** media 500, [ff] into the outer annular cavity 282, [gg] past the retainer 240, [hh] through the biocidally effective material. . .

DETDESC:

DETD(129)

The system 100 is operated to clean the **filter** 500 by (i) placing the tube 700 in fluid communication with a source of water (contaminated or purified) with the. . . the inlet passageway 260 and into the primary central cylindrical cavity 281, and brush the inner surface 503 of the **filter** 500 with the bristles 350 so as to release contaminants entrapped against the inner surface 503 of the **filter** 500 and entrain the released contaminants in the water retained within the primary central cylindrical cavity 281, (v) pushing downward on the plunger 400 so as to again brush the inner surface 503 of the **filter** 500 with the bristles 350 and force the water within the primary central cylindrical cavity 281 which now contains the contaminants removed from the **filter** 500 to flow [aa] through the inlet orifice 362 in the base 302 of the secondary container 300, [bb] through. . . and (vi) repeating

steps (ii) and (iii) until the desired removal of contaminants from the inner surface 503 of the **filter** 500 is obtained.

DETDESC:

DETD(130)

A clearance is provided between the sidewall 303 of the secondary container 300 and the **filter** 500. The clearance ensures unobstructed reciprocation of the secondary container 300 within the primary container 200 and provides a void. . . cleaning as the contaminated water flows into and out from the void volume between the secondary container 300 and the **filter** 500.

DETDESC:

DETD(159)
1246: inner annular **angled** **flange** on retainer

DETDESC:

DETD(246)
1500: **filter** media

DETDESC:

DETD(247)
1501: top of **filter** media

DETDESC:

DETD(248)
1502: bottom of **filter** media

DETDESC:

DETD(249)
1503: inner surface of **filter** media

DETDESC:

DETD(250)
1504: outer surface of **filter** media

DETDESC:

DETD(255)

The system 1000 includes (i) a cylindrical primary container 1200 which accommodates a cylindrical **filter** 1500 and a porous body of biocidally effective material 1600, (ii) a cylindrical secondary container 1300 reciprocally and sealably retained. . . of contaminated water (not shown) to be purified and including bristles 1350 for brushing the inner surface 1503 of the **filter** 1500 when the secondary container 1300 is reciprocated within the primary container 200, and (iii) a plunger 1400 reciprocally and. . . water into the secondary container 1300 and for forcing the contaminated water drawn into the secondary container 1300 through the **filter** 1500 and the porous body

of biocidally effective material 1600.

DETDESC:

DETD(261)

The . . . has a slightly larger diameter than the middle section 1245b so as to define an inner annular downwardly and outwardly **angled** **flange** 1246 between the middle portion 1244b and the lower portion 1244c. The middle portion 1244b of the inner sidewall surface. . .

DETDESC:

DETD(263)

A cylindrical **filter** 1500 is accommodated within the upper portion 1280a of the primary chamber 1280. The top 1501 of the **filter** 1500 is sealingly coupled by means of an O-ring seal 1220 to the upper inner annular horizontal flange 1231 defined by the sidewall 1203 of the primary container 1200. The bottom 1502 of the **filter** 1500 is adhesively bonded directly to an outer annular horizontal flange 1249 defined by the sidewall 1243 of the retainer 1240. The **filter** 1500 separates the upper portion 1280a of the primary chamber 1280 into a primary central cylindrical cavity 1281 and a. . .

DETDESC:

DETD(264)

The inner surface 1503 of the **filter** 1500 and the inner surface 1244 of the retainer 1240 are substantially vertically aligned so that the primary central cylindrical. . .

DETDESC:

DETD(273)

The base 1202 of the primary container 1200, retainer 1240 and **filter** 1500 are removable from within the primary container 1200 through the bottom of the primary container 1200 to facilitate replacement of the **filter** 1500, biocidally effective material 1600 and/or the optional active component 1650.

DETDESC:

DETD(274)

A . . . container 1300, and a transitional annular cavity 1375 between the outer sidewall 1303 of the secondary container 1300 and the **filter** 1500.

DETDESC:

DETD(291)

A . . . between the primary container 1200 and the retainer 1240. The skirt 1290 extends from the outside surface 1504 of the **filter** 1500

proximate the bottom 1502 of the **filter** 1500 in a outward and downward fashion into abutment with the sidewall 1203 of the primary container 1200. The skirt. . . outlet passageway 1270 during an upward stroke of the plunger 1400 and the secondary container 1300 while cleaning of the **filter** 1500.

DETDESC:

DETD(294)

The . . . orifice 1363 in the outer sidewall 1303 of secondary container 1300, [ff] into the transitional cavity 1375, [gg] through the **filter** media 1500, [hh] into the primary annular cavity 1282, [jj] through the annular passageway 1248 between the primary container 1200. . .

DETDESC:

DETD(298)

The system 1000 is operated to clean the **filter** 1500 by (i) placing the tube 1700 in fluid communication with a source of contaminated water with the plunger 1400. . . inlet passageway 1260 and into the primary central cylindrical cavity 1281, and [bb] brush the inner surface 1503 of the **filter** 1500 with the bristles 1350 so as to remove contaminants entrapped against the inner surface 1503 of the **filter** 1500 and entrain the released contaminants in the contaminated water drawn into the primary central cylindrical cavity 1281, (v) pushing. . . 1410, (vi) pushing downward on the plunger 1400 so as to simultaneously [aa] brush the inner surface 1503 of the **filter** 1500 with the bristles 1350, and [bb] force the contaminated water within the primary central cylindrical cavity 1281 which now contains the contaminants removed from the **filter** 1500 to flow [1] through the inlet orifice 1362 in the base 1302 of the secondary container 1300, [2] through. . . (vi) with the spindle 1460 continuously depressed until the desired removal of contaminants from the inner surface 1503 of the **filter** 1500 is obtained.

DETDESC:

DETD(300)

A clearance is provided between the sidewall 1303 of the secondary container 1300 and the **filter** 1500. The clearance ensures unobstructed reciprocation of the secondary container 1300 within the first container 1200 and provides a void. . . cycle as the contaminated water flows into and out from this void volume between the secondary container 1300 and the **filter** 1500.

DETDESC:

DETD(303)

The **filter** 500, 1500 functions to remove both suspended solids and larger pathogens from the contaminated water. Removal of the suspended solids. . . which must be removed (6 microns) as compared to the suspended solids (40 microns), pathogen removal controls selection of the **filter** media 500, 1500.

DETDESC:

DETD(304)

The . . . concentration of cysts such as Giardia lamblia and Giardia muris which are difficult to control by chemical means. Accordingly, the **filter** media 500, 1500 employed in the present invention should be capable of ensuring at least a three-log reduction in the. . .

DETDESC:

DETD(305)

The **filter** 500, 1500 may be constructed from any porous material capable of providing the proper pore sizes and possessing the necessary. . .

DETDESC:

DETD(306)

The . . . any sufficiently porous material capable of disinfecting water contaminated with harmful pathogens which are small enough to pass through the **filter** 500, 1500. The material must be capable of destroying the pathogens with a single pass of the water through the. . .

DETDESC:

DETD(312)

The frequency with which the **filter** 500, 1500 should be cleaned and the number of repetitions during each cleaning cycle depends upon the extent to which the contaminated water is contaminated with materials which will be entrapped against the **filter** 500, 1500. Typically, the **filter** 500, 1500 should be cleaned after the purification of about 1 to about 1000 liters of water with the bristles. . . cleaning cycle unnecessarily reduces efficiency the system 100, 1000 while overuse of the cleaning cycle unnecessarily hastens deterioration of the **filter** 500, 1500.

CLAIMS:

CLMS(1)

I claim:

1. An apparatus for producing potable water from contaminated water comprising:
a primary container defining a primary chamber,
a **filter** sealingly dividing the primary chamber into a first cavity and a second cavity with a first surface of the **filter** facing the first cavity and a second surface of the **filter** facing the second cavity,
a means retained within the first cavity for removing contaminants entrapped against the first surface of the **filter**, and
a manually operable plunger receivable within the first cavity and

comprising a means for forcing contaminated water retained within the first cavity through the **filter** when in a first mode and a means for activating the contaminant removal means for removing contaminants entrapped against the first surface of the **filter** when in a second mode: wherein the first and second modes are mutually exclusive.

CLAIMS:

CLMS(3)

3. The apparatus of claim 2 wherein (i) the **filter** comprises a means for filtering contaminated water so as to produce at least a three-log reduction in the concentration of. . .

CLAIMS:

CLMS(4)

4. The apparatus of claim 2 wherein (i) the **filter** comprises a means for filtering contaminated water so as to produce at least a 99.9% reduction in the concentration of. . .

CLAIMS:

CLMS(6)

6. An apparatus for producing potable water from contaminated water comprising:
a primary container defining a primary chamber,
a **filter** sealingly dividing the primary chamber into a first cavity and a second cavity with a first surface of the **filter** facing the first cavity and a second surface of the **filter** facing the second cavity,
an inlet passageway in the primary container through which the first cavity may be supplied with contaminated. . . communication with the second cavity,
a means within the first cavity for removing contaminants entrapped against the first surface of the **filter**,
a plunger reciprocally and sealingly engaged within the first cavity comprising a means for forcing contaminated water retained within the first cavity through the **filter**, into the second cavity, and out of the apparatus through the second outlet passageway, when in a first operational mode and removing contaminants entrapped against the first surface of the **filter** with the contaminant removal means, entraining the removed contaminants in contaminated water, and forcing the contaminated water containing the entrained. . .

CLAIMS:

CLMS(7)

7. . . . body of biocidally effective material retained within the second cavity for disinfecting water after passage of the water through the **filter**.

CLAIMS:

CLMS(8)

8. The apparatus of claim 6 wherein the primary chamber and **filter** are substantially cylindrical so as to define a substantially cylindrical first cavity and a substantially annular second cavity encircling the. . .

CLAIMS:

CLMS(10)

10. . . . of claim 6 wherein the means for removing entrapped contaminants comprises a means for brushing the first surface of the **filter**.

CLAIMS:

CLMS(12)

12. . . .
chamber and a second chamber,
a porous body of biocidally effective material retained within the second chamber for disinfecting contaminated water,
a **filter** sealingly dividing the first chamber into a first cavity and a second cavity with a first surface of the **filter** facing the first cavity and a second surface of the **filter** facing the second cavity,
a secondary container having an internal surface and an external surface which is reciprocally and sealingly retained. . . first cavity into a first volume within the secondary container and a second volume between the secondary container and the **filter**,
an inlet passageway in direct fluid communication with the first volume for permitting introduction of contaminated water into the first volume. . . of the secondary container for moving within the second volume and removing contaminants entrained against the first surface of the **filter** when the secondary container is reciprocated within the first cavity,
a manually operable plunger reciprocally and sealingly retained within the first. . . for forcing contaminated water retained within the first volume through the first outlet passageway, into the second volume, through the **filter**, into the second cavity, through the second outlet passageway, into the second chamber, through the biocidally effective material, and out. . . reciprocating the secondary container within the first cavity so as to remove contaminants entrapped against the first surface of the **filter**, entrain the removed contaminants in contaminated water, and force the contaminated water containing the entrained removed contaminants out of the. . .

CLAIMS:

CLMS(13)

13. . . .
chamber and a second chamber,
a porous body of biocidally effective material positioned within the second chamber for disinfecting contaminated water,
a **filter** sealingly dividing the first chamber into a first cavity

and a second cavity with a first surface of the **filter** facing the first cavity and a second surface of the **filter** facing the second cavity,
a secondary container reciprocally and sealingly retained within the first cavity and dividing the first cavity into a first volume within the secondary container and a second volume between the secondary container and the **filter**,
an inlet passageway in fluid communication with the first volume for permitting introduction of contaminated water into the first volume from. . . of the secondary container for moving within the second volume and removing contaminants entrained against the first surface of the **filter** when the secondary container is reciprocated within the first cavity,
a manually operable plunger reciprocally and sealingly retained within the first. . . (i) forcing contaminated water retained within the first volume through the first outlet passageway, into the second volume, through the **filter**, into the second cavity, through the second outlet passageway, into the second chamber, through the biocidally effective material, and out. . . third outlet passageway when in a first operational mode, and (ii) removing contaminants entrapped against the first surface of the **filter**, entraining the removed contaminants in contaminated water, and forcing the contaminated water containing the entrained removed contaminants out of the. . .

US PAT NO: 4,268,925 [IMAGE AVAILABLE] L5: 3 of 6
US-CL-CURRENT: 4/449, 111.6, 459, DIG.12; **210/199**

SUMMARY:

BSUM(10)

Another . . . (FIG. 2) shows a conduit disposed within each digestion tank. The submerged opening of the conduit is covered with a **filter**. The **filter** prevents suspended large solids from flowing up the conduit and into the subsequent digestion tank. Unfortunately as can be expected with all filters, the clogging which eventually occurs necessitates the removal and cleaning of the **filter**. This problem is most acute in the main digestion tank where the larger solids are encountered.

DETDESC:

DETD(13)

The . . . any excessively large solids that may have entered quiescent chamber 71. After settling, such solids sink toward opening 82 along **angled** **flange** 77. The solids then slide off the flange 77 and are gently redeposited into chamber 49 and recirculated in the. . .

US PAT NO: 4,127,484 [IMAGE AVAILABLE] L5: 4 of 6
TITLE: **Filter** relief valve assembly
US-CL-CURRENT: **210/130**, **168**, **440**

ABSTRACT:
A **filter** relief valve assembly for a simple, easy to assemble use with **filter** structures of the common oil **filter** throw away type which will function to permit oil bypass of the **filter** element

DETDESC:

DETD(40)

The outer periphery of the outer casing **cap** 52 also has a depending **flange** 110 (FIG. 5) substantially parallel to the longitudinal axis of aperture 108. The flange 110 corresponds to the shape of. . .

DETDESC:

DETD(51)

The . . . inside of the enclosed heat exchanger unit 56. Similarly, the O-ring 79 on flange 78 abuts the inside of the **flange** 109 on outer casing **cap** 52. Further, the coils 16 abut the outside diameter of interior housing 20. A force is then applied to the. . .

DETDESC:

DETD(53)

The . . . flange 78 at the larger end, or top of the enclosed fiber bundle unit 54 is resiliently urged against the **flange** 109 on the end **cap** 52 of the enclosed heat exchanger unit 56. The O-ring 79 on flange 78 provides a seal between the top. . .

DETDESC:

DETD(55)

The . . . an adhesive to ensure gastight joints. Specifically, the one-way valve 69 is connected to the port 118 in the top **cap** 32. The **flange** 114 on top **cap** 32 is then inserted into the aperture 108 on the outer casing cap 52. The bayonet tabs 116 correspond with. . .

US PAT NO: 5,234,663 [IMAGE AVAILABLE] L6: 3 of 10
US-CL-CURRENT: **422/46**; 95/46; 96/6, 7; 128/DIG.3; 210/321.79, 321.88, 487, 497.1; 261/DIG.28; **422/48**

DETDESC:

DETD(39)

The **cap** 52 has a downwardly depending **flange** 109 which forms a circular hole or aperture 108 in the center of the cap 52 (FIG. 3). There are. . .

DETDESC:

DETD(40)

The outer periphery of the outer casing **cap** 52 also has a depending **flange** 110 (FIG. 5) substantially parallel to the longitudinal axis of aperture 108. The flange 110 corresponds to the shape of. . .

DETDESC:

```
=> s vari?(2a)capacity and oxygenator

SEARCH ENDED BY USER
=>
=> s variable (3a)(volume or capacity or size) and oxygenator

        291010 VARIABLE
        438654 VOLUME
        262718 CAPACITY
        778200 SIZE

         15981 VARIABLE (3A)(VOLUME OR CAPACITY OR SIZE)
           840 OXYGENATOR
L1          32 VARIABLE (3A)(VOLUME OR CAPACITY OR SIZE) AND OXYGENATOR
=> s l1 and angled flange
         82230 ANGLED
        256204 FLANGE
           567 ANGLED FLANGE
                 (ANGLED(W)FLANGE)
L2           0 L1 AND ANGLED FLANGE
=> s l1 and L-shaped
        481180 L
        706357 SHAPED

         70723 L-SHAPED
                 (L(W)SHAPED)
L3           0 L1 AND L-SHAPED
=> s oxygenator(p)angled flange

           840 OXYGENATOR
         82230 ANGLED
        256204 FLANGE
           567 ANGLED FLANGE
                 (ANGLED(W)FLANGE)
L4           0 OXYGENATOR(P)ANGLED FLANGE
=> s oxygenator(p)L-shaped

           840 OXYGENATOR
        481180 L
        706357 SHAPED
         70723 L-SHAPED
                 (L(W)SHAPED)
L5           3 OXYGENATOR(P)L-SHAPED
=> d l5 1-3

1.  5,304,164, Apr. 19, 1994, Quick-changeover blood handling apparatus;
Erin J. Lindsay, 604/403; 137/614.01; 403/349; 604/4 [IMAGE AVAILABLE]
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2. 5,254,080, Oct. 19, 1993, Quick-changeover apparatus for handling medical fluid; Erin J. Lindsay, 604/4; 128/DIG.3; 604/319, 405, 406 [IMAGE AVAILABLE]

3. 5,149,318, Sep. 22, 1992, Quick-changeover blood handling apparatus; Erin J. Lindsay, 604/4; 128/DIG.3; 604/319, 405, 406 [IMAGE AVAILABLE]
=>

```
=> s variable capacity(p)oxygenator
        291010 VARIABLE
        262718 CAPACITY

          1752 VARIABLE CAPACITY
                 (VARIABLE(W)CAPACITY)
           840 OXYGENATOR
L6           3 VARIABLE CAPACITY(P)OXYGENATOR
=> d l6 1-3

1.  4,108,607, Aug. 22, 1978, Blood gas simulator; Bert David Pearson, et
al., 422/45; 128/DIG.3; 422/68.1, 82.04; 436/11 [IMAGE AVAILABLE]

2.  4,033,724, Jul. 5, 1977, **Oxygenator** having a **variable**
**capacity** oxygenating tube; Tatsuo Tamiya, 422/45; 128/DIG.3;
261/DIG.28 [IMAGE AVAILABLE]

3.  4,026,669, May 31, 1977, Variable capacity reservoir assembly; Ronald
James Leonard, et al., 422/44; 128/DIG.3; 383/2, 69; 604/4, 122, 262
[IMAGE AVAILABLE]
=> s l6 and angled(2a)flange
         82230 ANGLED
        256204 FLANGE
```